

A review of the genus *Sernokorba* Kamura, 1992 (Araneae, Gnaphosidae)

Nikolett Gallé-Szpisjak¹, Róbert Gallé^{1,2}, Tamás Szűts³

¹ ELKH Centre for Ecological Research, Lendület Landscape and Conservation Ecology Research Group, Alkotmány út 2-4. Vácrátót, 2163, Hungary

² MTA-SZTE ‘Momentum’ Applied Ecology Research Group, Közép fasor 52, Szeged, 6726 Hungary

³ Department of Ecology, University of Veterinarian Medicine Budapest, Rottenbiller u. 50, Budapest, 1077, Hungary

<https://zoobank.org/8ABCBD1-84C8-4761-8A6E-85EBF34D1507>

Corresponding author: Nikolett Gallé-Szpisjak (szpisjak.nikolett@ecolres.hu)

Academic editor: Danilo Harms ♦ **Received** 6 March 2023 ♦ **Accepted** 16 May 2023 ♦ **Published** 2 June 2023

Abstract

The gnaphosid spider genus *Sernokorba* Kamura, 1992 is reviewed. While *Sernokorba pallidipatellis* (Bösenberg and Strand 1906) and *Sernokorba fanjing* Song, Zhu & Zhang, 2004, occur in the Far East and the Japanese archipelago, *Sernokorba tescorum* (Simon, 1914) is known from Europe. We here describe a fourth species, *Sernokorba betyar* **sp. nov.** (male and female) from the forest steppe vegetation in southern Hungary in Central Europe. Digital images, comparative drawings (except for *S. fanjing*) and a distribution map are provided for all the species, and an identification key is compiled. The cheliceral dentation as diagnostic character and its interpretation are discussed.

Key Words

Central Europe, forest steppe, identification key, new species, spider

Introduction

Kamura (1992) described the monotypic ground spider genus *Sernokorba* to accommodate *Prothesima pallidipatellis* Bösenberg & Strand, 1906 from Japan, which was at that time placed in *Zelotes* Gistel, 1848, since it lacks the preening comb on metatarsi III–IV characteristic of the genus. The species occurs also in China (Song et al. 1999), Korea (Namkung 2002) and Russian Far East (Marusik 2009). According to Kwon et al. (2014), this ground-dwelling species occurs in a wide variety of habitats, in forests, vineyards and grasslands. Currently, three species of the genus are known. The second species, *Sernokorba fanjing* Song, Zhu & Zhang, 2004 was described from Mt. Fanjing, Guizhou, China.

The third species occurs in Europe. It was originally described as *Poecilochroa tescorum* Simon, 1914

on the basis of a female specimen. In their recent study, Cornic and Ledoux (2013) revised the species, described the male and proposed a new combination, *Sernokorba tescorum* (Simon, 1914). The species has been collected in nine locations in southern France, in grasslands and pine forests on calcareous soil. Later, Hernandez-Corral et al. (2017) and Breitling (2018) provided new occurrence data from the Iberian Peninsula, from a *Quercus rotundifolia*, Lamarck forest and a dry grassland, respectively. Naumova et al. (2021) reported the species from Bulgaria, from the leaf litter of a mixed forest of *Fagus sylvatica*, Linnaeus and *Pinus heldreichii*, Christ. In this paper we report, describe and illustrate *Sernokorba* specimens from Hungary for the first time, belonging to a hitherto unknown species, which we hereby describe as new to science. We provide an identification key, and illustrate occurrences of the genus, except for *S. fanjing*.

Materials and methods

The specimens of the new species were collected in the calcareous sand-dune area of the Kiskunság, central Hungary. The region belongs to the forest steppe zone, the transitional biome between the temperate deciduous forest and the steppe zones in Eurasia (Gallé et al. 2022a). The region has a semiarid continental climate, as the mean annual precipitation is between 500–550 mm and the annual temperature is between 10 °C and 12 °C (Gallé et al. 2022a). The calcareous soil is poor in organic matter (Tölgyesi et al. 2018). The forest steppe vegetation appears as a mosaic of (1) open dry grasslands: brome sward (*Brometum tectorum*), caliciphilous festuca steppe (*Festucetum vaginateae*) and Pannonian sand grassland (*Potentillo-Festucetum pseudovinae*), (2) wind-grooves between the sand dunes: more humid, with dune-slack purple moorgrass meadow (*Molinio-Salicetum rosmarinifoliae*) as main vegetation type, and (3) small forest patches of native arboreal plants such as *Populus alba*, *Crataegus monogyna* and *Juniperus communis*. Spiders were sampled with funnel traps (Császár et al. 2018), near Fülöpháza in an intact forest steppe fragment, approximately 3.3 km² (46°52'N, 19°24'E, Figs 1–4). A total of 10 sites were established, and in each site, three habitat types (grassland, forest and forest edge) were sampled with four traps in each habitat. Samplings were done between 18 May and 12 June 2014. We collected 21 out of the 28 specimens in the forest edges.

Type material of the new species will be deposited in the Hungarian Museum of Natural History, Budapest (HMNH, curator: E. Deákné Lazányi-Bacsó). A male of *S. tescorum* has been kindly loaned to us by Antonio Melic (Sociedad Entomológica Aragonesa: PCAM). Specimens of *S. pallidipatellis* have been kindly donated to HNHM (Hungarian Natural History Museum, Budapest,) by Prof. Takahide Kamura (Otemon Gakuin University). We did not have access to specimens of *S. fanjing*.

Specimens were photographed using a Nikon D300S camera and a Tucsen TrueChrome Metrics camera attached to a Nikon S800 stereomicroscope and a Nikon Eclipse E200 compound microscope at the Department of Ecology, University of Veterinarian Medicine Budapest. Digital multifocal images were assembled using HeliconFocus image stacking software. Epigynes were removed and illustrations of them were made after a day-long maceration in commercial pancreatic enzyme solution. Palps were examined immersed in methyl-salicylate and mounted in a slightly modified Coddington mount (Coddington 1983). We modified the mount as the coverslip is not horizontal, but touching the slide itself, thus creating a triangle allowing more precise manipulation and more stable fixation of the object. Illustrations of the new species, *S. tescorum* and *S. pallidipatellis* were redrawn from digital images, while for *S. fanjing* they were produced from the figures of the original description (Song et al. 2004). We used Adobe Illustrator CS6 vector graphics software. We illustrated the distribution of the *Sernokorba* species with Google Earth satellite images, and Adobe Photoshop CS6 software.

Measurements are given in mm. Lengths of leg segments and total length were measured on the dorsal view. Leg formula developed by Ono (1988) is used; lengths of leg segments are given as: total length (femur, patella, tibia, metatarsus, tarsus).

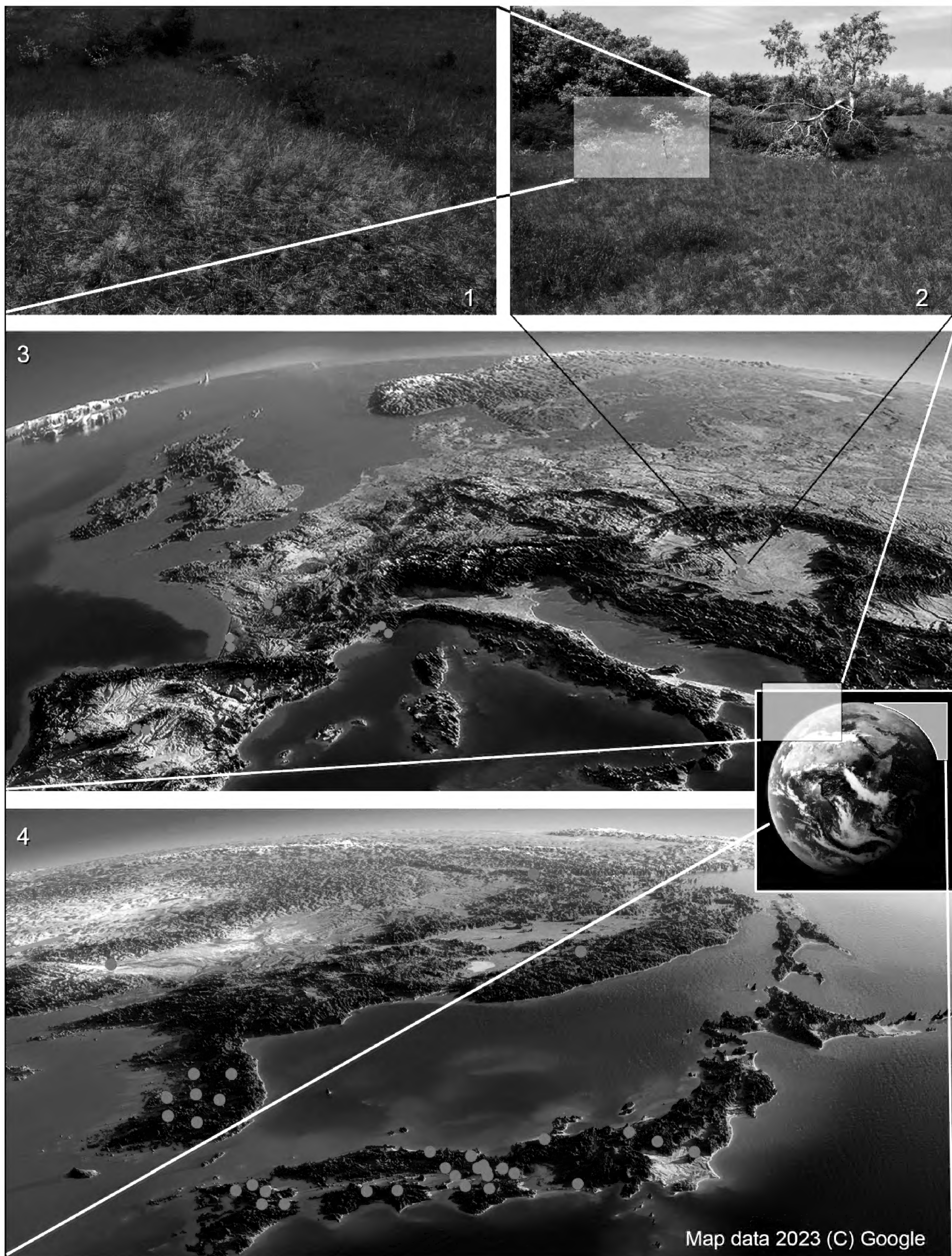
Abbreviations

AME	anterior median eyes;
d	dorsal;
p	prolateral;
r	retrolateral;
RTA	retrolateral tibial apophysis;
v	ventral.

Results

Key to the species

1	Females	2
–	Males.....	5
2	Copulatory openings well visible (Figs 46, 47)	<i>Sernokorba fanjing</i>
–	Copulatory openings not clearly visible (Figs 40–45).....	3
3	Spermathecae relatively small (i.e., ~50% of the height of the vulva); sperm ducts straight (Figs 44, 45).....	<i>Sernokorba pallidipatellis</i>
–	Spermathecae relatively large (i.e., over 70% of the height of the vulva); sperm ducts with a proximal characteristic switchback (Figs 40–43).....	4
4	Lateral edge of spermatheca with an angular posterior edge (Figs 28, 40, 41).....	<i>Sernokorba betyar</i> sp. nov.
–	Lateral edge of spermatheca round (Figs 42, 43)	<i>Sernokorba tescorum</i>
5	Embolar tip slightly bent (Figs 23, 33, 34).....	<i>Sernokorba pallidipatellis</i>
–	Embolar tip straight (Figs 20–22, 29–32)	6
6	Conductor blunt (Figs 29, 30, 35, 36), spermophore strongly bent as seen in retrolateral view, ventral bump on the RTA absent (Figs 13, 30).....	<i>Sernokorba tescorum</i>
–	Conductor with fin-like branches (Figs 17–19, 31, 32, 37, 38), spermophore almost straight as seen in retrolateral view, ventral bump on the RTA present (Figs 14, 15, 32)	<i>Sernokorba betyar</i> sp. nov.



Figures 1–4. The habitat and distribution of *Sernokorba* species; **1, 2.** Habitat of *S. betyar* in Fülöpháza (Hungary); **3.** Occurrences in Europe, red dots: *S. betyar*, yellow dots: *S. tescorum*; **4.** Occurrences in Asia, green dots: *S. pallidipatellis*.

Taxonomy

Subfamily: Herpyllinae Platnick, 1990 (type genus *Herpyllus* Hentz, 1832)

Genus *Sernokorba* Kamura, 1992

Diagnosis. The genus is a members of the Herpylline group (Azevedo et al. 2018), with a conspicuous black and white abdominal pattern (Figs 5–7). Males can be recognized by the following combination of characters: a single RTA that is about as long as the cymbium, thin, slightly bent, evenly narrowing terminally, and with a hook-shaped end (Figs 13–16). The conductor is about as long or longer than the tegulum, not twisted around the embolus (Figs 9–11, 13–15, 29, 31, 33). Females can be recognized by the kidney-shaped spermathecae (Figs 40, 42) and the sperm ducts being as long as the height of the spermathecae (Figs 40, 42, 44, 46).

Description. See Kamura (1992). Furthermore, males in all the three examined species have a characteristic apical depression on the retrolateral side of gnathocoxae (Fig. 8), which females do not have (Kamura 1992: fig. 4, Murphy 2007: 296, 310). This sexually dimorphic character, was not mentioned in the original descriptions of *S. pallidipatellis* and *S. tescorum*, or in the description of the genus itself.

Distribution. The genus has been reported from East Asia (Korea, China, Russia and Japan) and from Western, Central and Southern Europe.

Type species. *Prosthesima pallidipatellis* Bösenberg & Strand, 1906 – by original designation by Kamura (1992); female holotype from JAPAN: Saga Pref., in Senckenberg Museum, Frankfurt am Main – not examined.

Sernokorba pallidipatellis (Bösenberg & Strand, 1906)

Figs 12, 16, 23, 33, 34, 39, 44, 45, 48–50

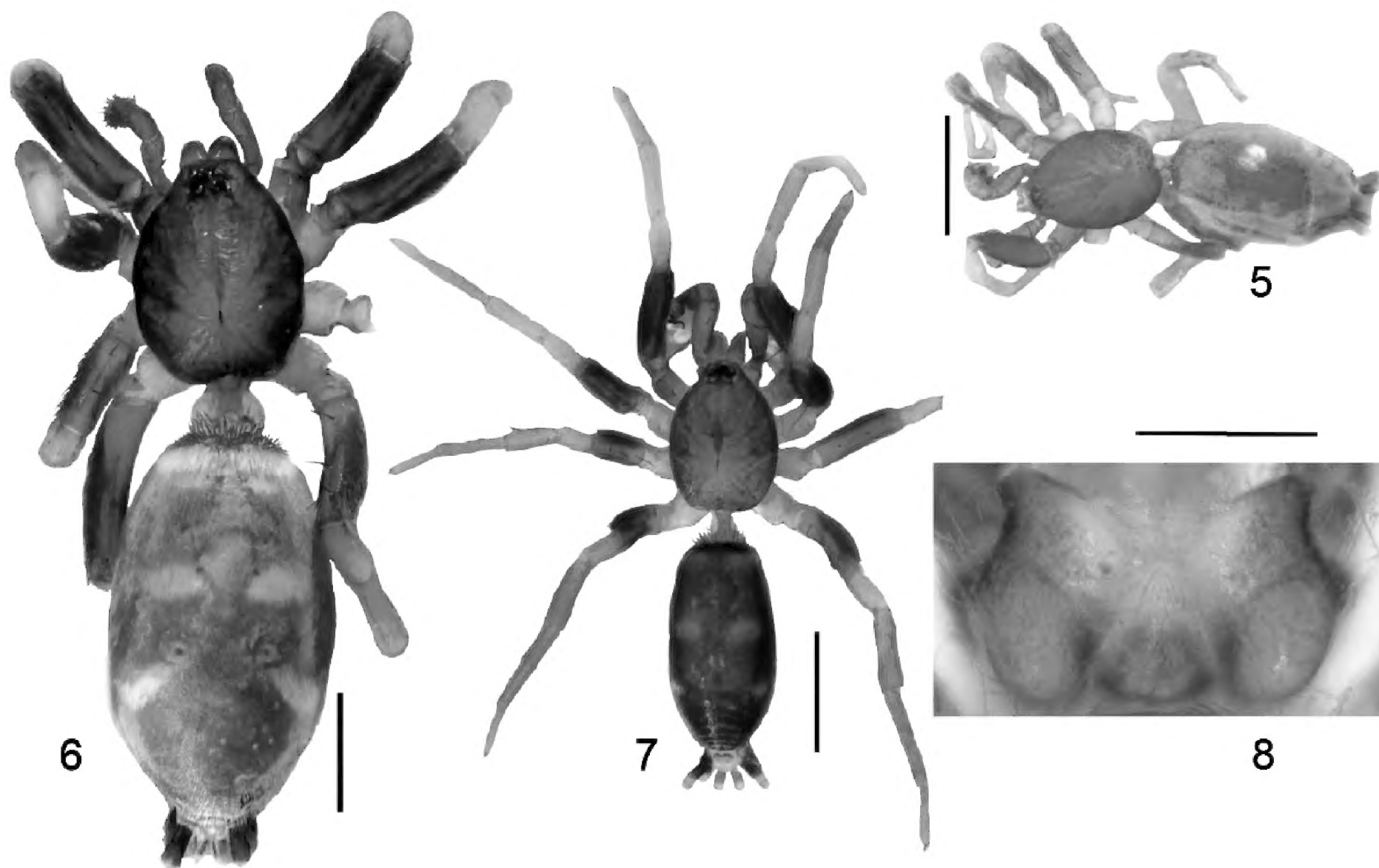
Remark. As mentioned by Kamura (1992), *Herpyllus coreanus* Paik, 1992 is most likely conspecific with *S. pallidipatellis*; however, we do not propose a formal synonymy as we did not examine the type specimen of *H. coreanus*.

Material examined. JAPAN: **Kyoto** 1 male, Kyoto-shi, Sakyo-ku, Matsugasaki, 28. April–5. May 1982 pitfall trap T. Kamura leg. (HNHM Araneae-9237); JAPAN: **Osaka** 1 male, Ibaraki-shi, Nishi-Ai, 26. May 1995 T. Kamura leg. (HNHM Araneae-9233); JAPAN: **Osaka** 1 female, Ibaraki-shi, Ai, 30. May 1997 T. Kamura leg. (HNHM Araneae-9219); JAPAN: **Osaka** 1 female, Ibaraki-shi, Nishi-Ai, 9. May 2003 T. Kamura leg. (HNHM Araneae-9007).

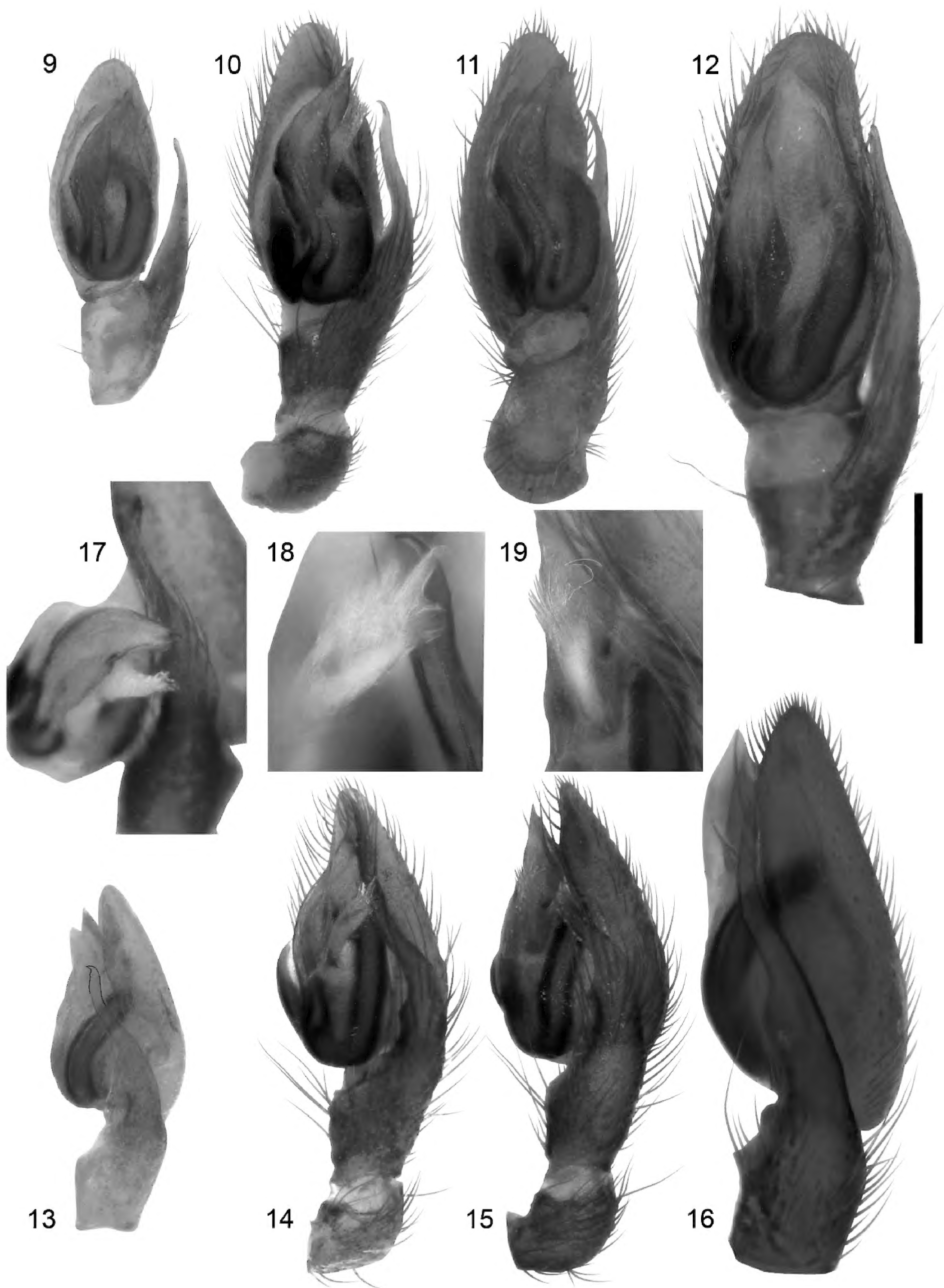
Diagnosis. Males can be recognized by the slightly bent embolar tip (Figs 23, 33) and by the large conductor reaching the tip of the embolus (Figs 33–34). Distal tip of the conductor is blunt and triangular. RTA with a ventral bump and bearing a distal invagination, resulting in two subequal branches.

Description. See Kamura (1992).

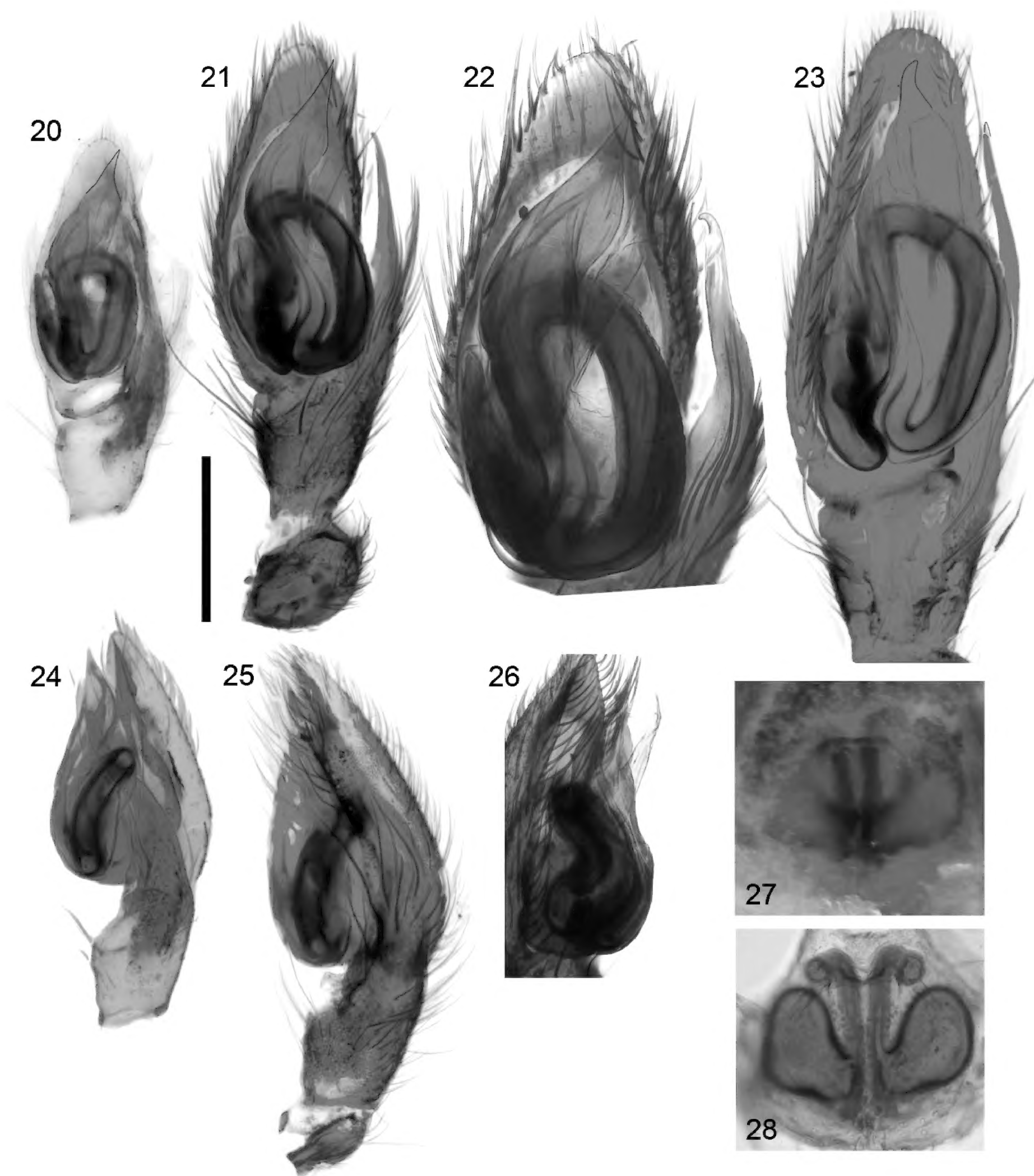
Distribution. Japan, Korea and the Russian Federation.



Figures 5–8. European *Sernokorba* species; **5.** *Sernokorba tescorum*, male habitus, dorsal view; **6–8.** *Sernokorba betyar* sp. nov.; **6.** Female habitus, dorsal view; **7.** Male habitus, dorsal view; **8.** Male, gnathocoxae, ventral view. Scale bars: 1.0 mm.



Figures 9–19. Palp comparison of the *Sernokorba* species; **9, 13.** *Sernokorba tescorum* **9.** Ventral view; **13.** Retrolateral view; **10, 11, 14, 15, 17–19.** *Sernokorba betyar* sp. nov. **10.** Ventral view; **11.** Proventral view; **14, 15.** Retrolateral view; **17.** Partially expanded palp, showing the conductor details, retrolateral view; **18.** Conductor closeup, retrolateral view; **19.** Slightly different angle; **12, 16.** *Sernokorba pallidipatellis*; **12.** Ventral view; **16.** Retrolateral view. Scale bar: 0.25 mm.



Figures 20–28. Cleared copulatory organs; **20, 24.** *Sernokorba tescorum*; **20.** Ventral view; **24.** Retrolateral view; **21, 22, 25–28.** *Sernokorba betyar* sp. nov.; **21, 22.** Ventral view; **25.** Retrolateral view; **26.** Prolateral view; **27.** Epigyne, ventral view; **28.** Vulva, dorsal view; **23.** *Sernokorba pallidipatellis*, ventral view. Scale bar: 0.25 mm.

***Sernokorba tescorum* (Simon, 1914)**

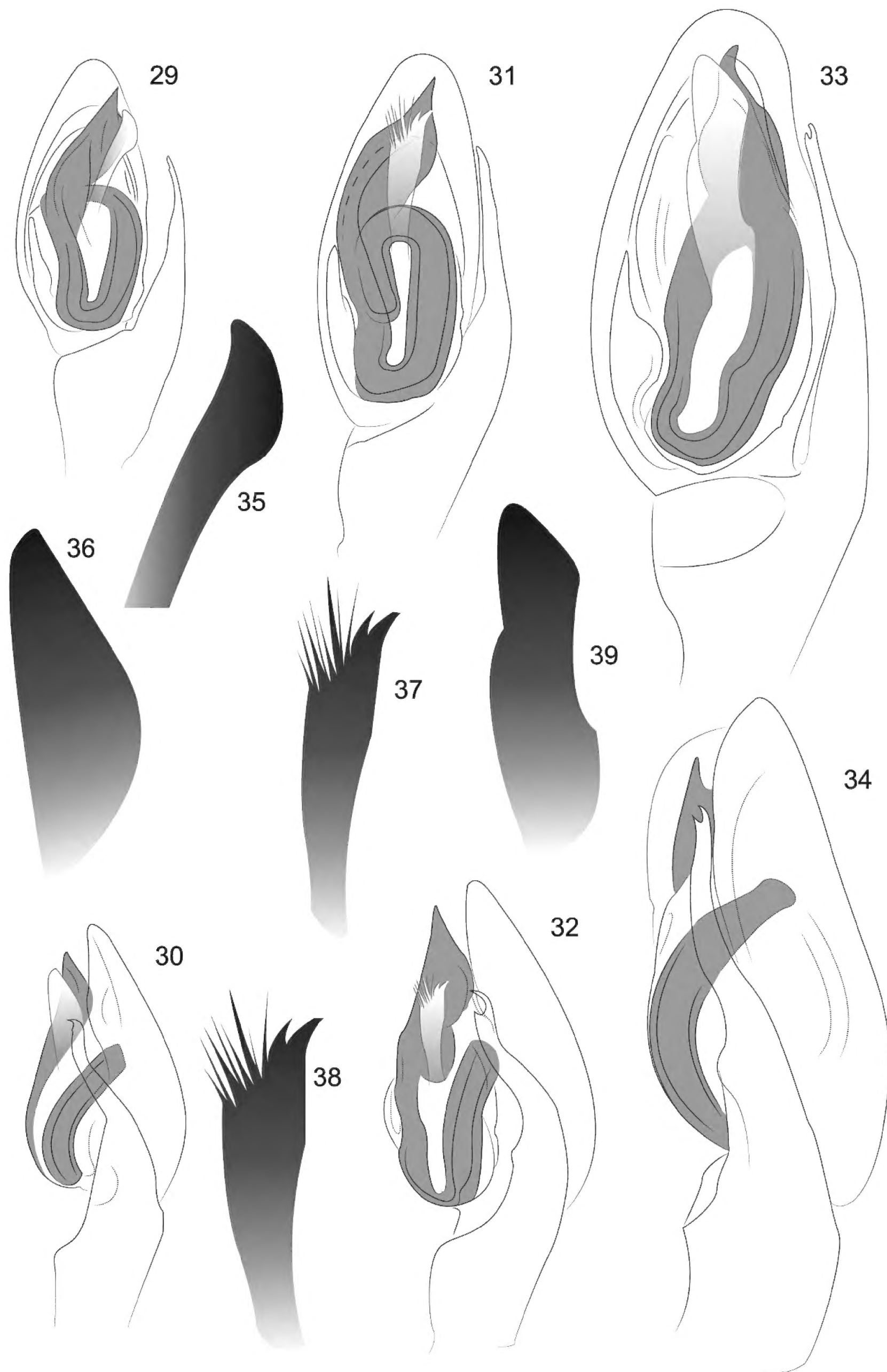
Figs 5, 9, 13, 20, 24, 29, 30, 35, 36, 42, 43

Remark. This species was recently reported from the Balkans, Bulgaria (Naumova et al. 2021). Fortunately, the record is accompanied with high quality images, and it is clear that the specimen shows some differences (i.e., in size of the cymbium, shape of the cymbium, the absence of clear finger-like extensions, and the coil shape of the spermathecae) from the new species. However, we do not suggest any identification without examining the specimen itself.

Material examined. SPAIN: **Cantoblanco:** 1 male, Monte de Valdelatas Madrid. UTM: 30TVK4287, 40°32'11.5"N, 3°41'05.0"W, 700 m, 2002 May 27. A. Jiménez leg. (PCAM 5949).

Diagnosis. Abdominal pattern consists of three pairs of elongated white spots. Males have blunt conductor (Figs 9, 29, 35, 36). The female is very similar to that of the new species, but can be differentiated by the round spermathecae (Figs 42, 43).

Description. See Hernández-Corral et al. (2017) and Cornic and Ledoux (2013).



Figures 29–39. Illustrations of the male copulatory organs; **29, 30, 35, 36.** *Sernokorba tescorum*; **29.** Male copulatory organ ventral view; **30.** Male copulatory organ, retrolateral view; **35.** Conductor ventral view; **36.** Conductor retrolateral view; **31, 32, 37, 38.** *Sernokorba betyar* sp. nov.; **31.** Male copulatory organ ventral view; **32.** Male copulatory organ retrolateral view; **37.** Conductor ventral view; **38.** Conductor retrolateral view; **33, 34, 39.** *Sernokorba pallidipatellis*; **33.** Male copulatory organ ventral view; **34.** Male copulatory organ retrolateral view; **39.** Conductor ventral view.

Distribution. France, Spain and Bulgaria (Naumova et al. 2021; Nentwig et al. 2022). A combination of all the published occurrences until 2020 (Cornic and Ledoux 2013; Hernández-Corral et al. 2017; Breitling 2018) is shown in fig. 3.

***Sernokorba betyar* sp. nov.**

<https://zoobank.org/FD527ED0-2148-47D0-8E28-22B555FC37E3>

Figs 6–8, 10, 11, 14, 15, 17–19, 21, 22, 25–28, 31, 32, 37, 38, 40, 41, 51, 52

Type material. Holotype: HUNGARY: **Fülöpháza:** male (46°51'55.00"N, 19°24'27.18"E) forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9230).

Paratypes: HUNGARY: **Tázlár:** 1 male, 46°30'27.62"N, 19°30'2.22"E, forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9229); HUNGARY: **Fülöpháza:** 1 female 46°52'47.57"N, 19°24'17.36"E, forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9228); HUNGARY: **Fülöpháza:** 2 male, 46°52'46.93"N, 19°24'43.59"E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9231); HUNGARY: **Fülöpháza:** 1 female 46°53'13.61"N, 19°24'33.89"E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9241); HUNGARY: **Fülöpháza:** 1 male, 46°52'9.10"N, 19°24'56.25"E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9238).

Other material examined. HUNGARY: **Tázlár:** 1 male, 1 female, 46°31'7.83"N, 19°31'10.80"E, forest edge, pitfall trap 1–10. June 2014 R. Gallé & N. Gallé-Szpisjak leg.; HUNGARY: **Fülöpháza:** 1 male, 1 female, 46°52'15.25"N, 19°24'29.06"E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9208).

Diagnosis. The male can be identified by the finger-like extensions on the tip of the conductor (Figs 37, 38), and by the almost straight spermophore as seen from the retrolateral side (Fig 25, 32). Also, the male has an apical ectal depression on the gnathocoxae (Fig. 8), similar to that of *S. tescorum*. The female can be distinguished by the edge of the spermathecae: the lateral edge is more or less straight (vs. rounded in *S. tescorum*) and the posterior edge is concave (vs. convex in *S. tescorum*). Also, it can be distinguished by the deep atrial pockets (Figs 27, 28, 40, 41) opposed to the shallow atrial pokets of the *S. tescorum*.

Description. Male (Holotype; HNHM Araneae-9230). Colour. Carapace light brown with pale brown radiating stripes, covered with white fine setae (Fig. 7); thoracic groove dark brown (Fig. 7). Chelicerae pale brown (Fig. 7). Gnathocoxae brown with a dark brown outline; terminal part in ventral view pale yellow. Labium brown (Fig. 8). Sternum brown with radial light brown spots, posterior end dark brown. Trochanter I brown, all other trochanters pale yellow. All femora dark brown; all other leg segments pale yellow. Abdomen dark greyish brown with a reddish scutum; an anterior transverse line and two

pairs of whitish spots present in the area of the scutum; anterior pair of spots placed closer to the midline, posterior pair situated laterally. Venter light greyish yellow, with two thin longitudinal stripes starting at epigastric furrow and extending towards spinnerets. Epigastric area yellowish–brown. Sides of abdomen dark brown. Spinnerets' proximal segments dark brown/black, distal part pale yellow.

Carapace suboval, cephalic region much narrower (about 40% of maximal width), posterior region truncated (Fig. 7) and elevated, about twice as high as in front. Chelicerae thin, with one tooth on promargin and two teeth on retro-marginal. Gnathocoxae with an oblique depression on the lateral margin (Fig. 8). Sternum longer than wide. Labium as long as wide (Fig. 8), triangular. Clypeus low, about the diameter of AME high. Abdomen ovoid, longer than wide, truncated in front, with scutum covering 60% of the dorsum (Fig. 5). Total length, not including spinnerets, 4.32. Carapace 1.35 long, 0.98 wide, 0.41 high, highest at coxae III, widest at coxae II. Abdomen 2.72 long, 0.87 wide, with large bristles on proximal margin. Clypeus low, 0.10.

Leg measurements: I 3.05 (1.01, 0.42, 0.65, 0.51, 0.46); II 3.00 (0.99, 0.43, 0.63, 0.48, 0.47); III 2.89 (0.94, 0.39, 0.63, 0.47, 0.46); IV 3.99 (1.07, 0.57, 0.82, 1.0, 0.53). Leg formula IV-I-II-III.

Leg spination: I: femur d 1-1-1, p 0-0-1; tibia v 0-1-1. II: femur d 1-1-1, p 0-0-1; tibia v 0-1-1. III: femur d 1-1-1, p 0-0-1, r 0-0-1; patella p1, r1; tibia p 0-1-1 v 0-1-1, r 0-1-1; metatarsus p 0-1-2, r 0-0-2, v 0-0-1. IV: femur d 1-1-1, p 0-0-1, r 0-0-1; tibia d 0-1-0, p 1-1-1, v 1-1-1, r 0-1-1; metatarsus p 1-2-2, v 1-0-0, r 1-1-2.

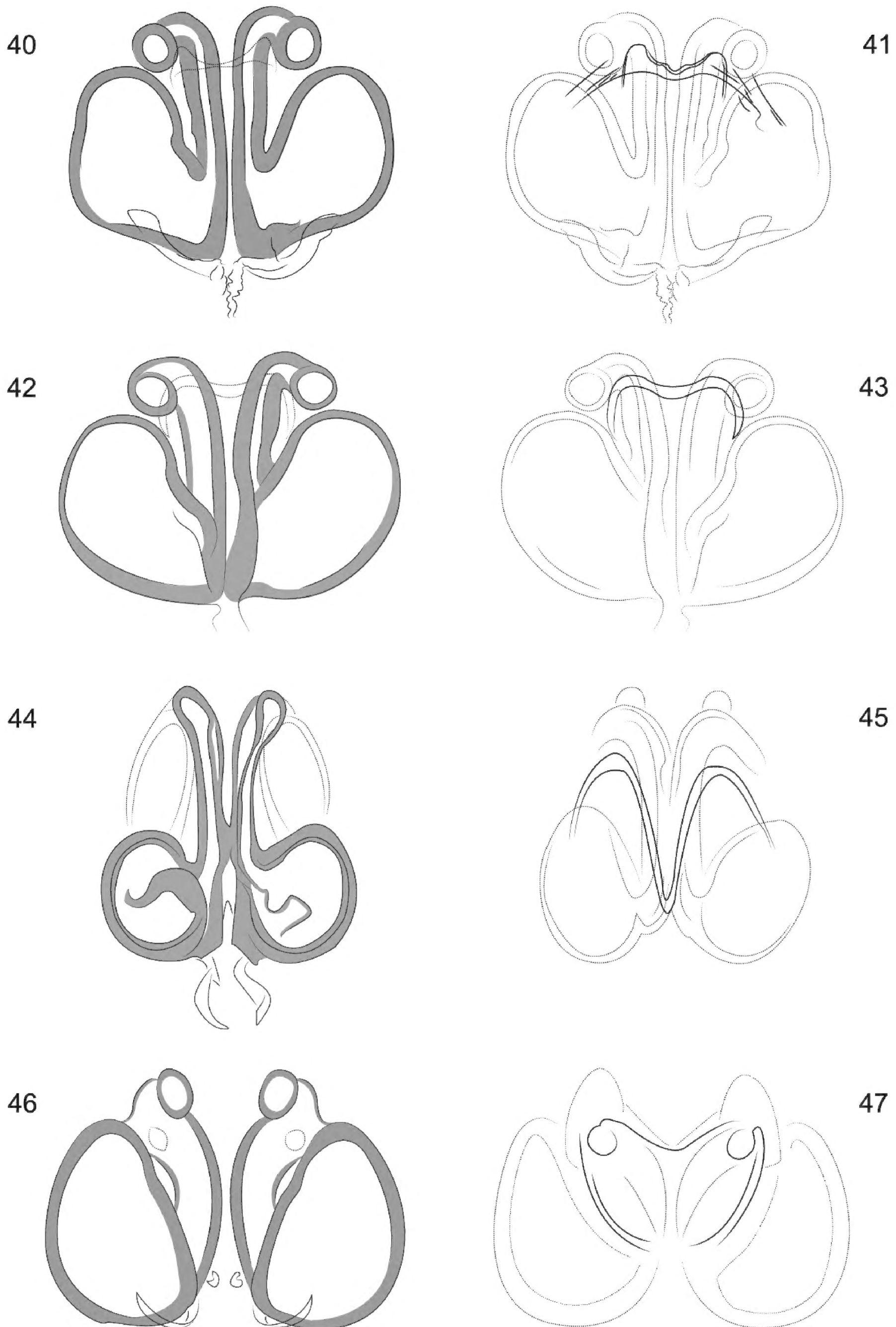
Palp: Tibia longer than wide, RTA about 70% at cymbium's length (Figs 10, 11, 21, 22, 25), thin, bent in its middle and with an apical hook (Figs 14, 15, 32); spermophore U-shaped, proximal part of tegulum is tight (Figs 10, 11, 21, 22) (vs. loose in that of *S. tescorum*, as shown in Figs 9, 20). Spermophore bent slightly in retrolateral view (Figs 15, 25). Conductor membranous, with finger-like extensions (Figs 17–19, 31, 32, 37, 38).

Female (Paratype; HNHM 9241). Coloration as in male, except carapace and abdomen lighter (Fig. 6). Epigastric area yellowish–dark grey. Shape of carapace and abdomen (Fig. 6) as in males, except for absence of abdominal scutum. Total length, not including spinnerets, 4.04. Carapace 1.98 long, 1.50 wide, 0.57 high. Abdomen 3.58 long, 2.03 wide, 1.19.

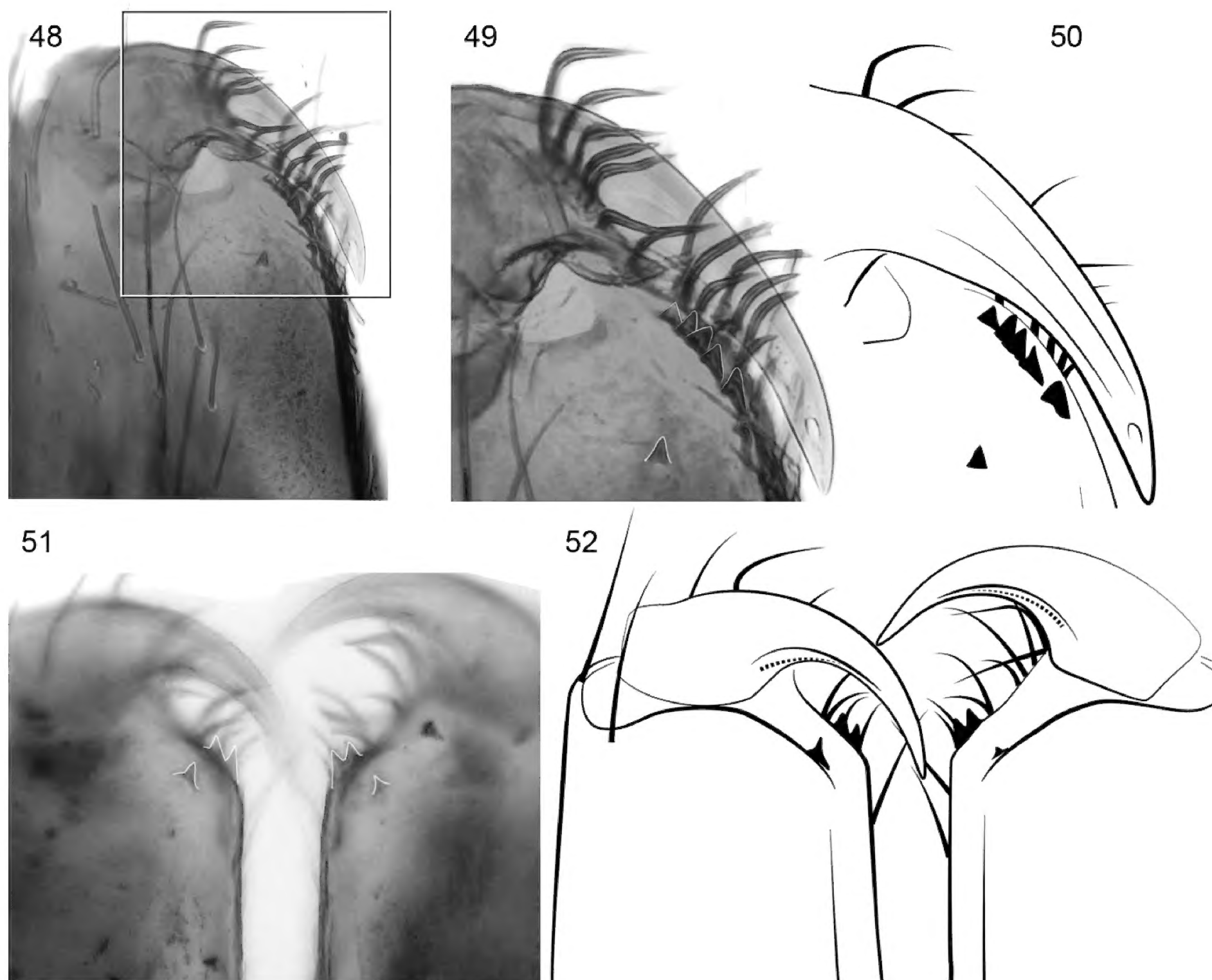
Leg measurements: I 4.19 (1.45, 0.58, 0.82, 0.74, 0.60); II 4.13 (1.43, 0.57, 0.80, 0.75, 0.58); III 4.11 (1.30, 0.54, 0.81, 0.89, 0.57); IV 5.67 (1.65, 0.63, 1.21, 1.45, 0.73). Leg formula. IV-I-II-III.

Leg spination: I: femur d 1-1-1, p 0-0-1; tibia v 0-1-1. II: femur d 1-1-1, p 0-0-1; tibia v 0-1-1. III: femur d 1-1-1, p 0-0-1, r 0-0-1; patella p1, r1; tibia d 1-0-0, p 1-1-1 v 1-1-1, r 0-1-1; metatarsus d 0-1-1, p 0-1-1, r 0-1-1, v 1-0-1. IV: femur d 1-1-1, p 0-0-1, r 0-0-1; tibia d 1-0-0, p 1-1-1, v 1-1-2, r 0-1-1; metatarsus p 1-2-2, v 1-1-1, r 1-2-2.

Epigyne: copulatory openings positioned medially on anterior part; copulatory ducts short; spermathecae robust and pear-shaped.



Figures 40–47. Illustrations of the female genitalia; **40, 41** *Sernokorba betyar* sp. nov.; **40.** Dorsal view; **41.** Ventral view; **42, 43.** *Sernokorba tescorum*; **42.** Dorsal view; **43.** Ventral view; **44, 45.** *Sernokorba pallidipatellis*; **44.** Dorsal view; **45.** Ventral view; **46, 47.** *Sernokorba fanjing*; **46.** Dorsal view; **47.** Ventral view.



Figures 48–52. Male chelicerae; **48–50.** *Sernokorba pallidipatellis*; **51, 52.** *Sernokorba betyar* sp. nov.

Etymology. The specific name is a Hungarian noun in apposition and refers to the outlaws “betyár” found in hiding places on the Hungarian Great Plain, just as this species has been avoiding its discovery so far.

Distribution. Bács-Kiskun county, Forest steppes, Hungary.

Discussion

In the genus description of *Sernokorba*, Kamura (1992) mentioned concerning *S. pallidipatellis*: “I recognized that this species is unique in having a serrated carina on the promargin of fang furrow of chelicera”, unequivocally illustrated (Kamura 1992: fig. 3), and used in this sense by subsequent authors (Song et al. 2004; Kim and Lee 2013) for *S. fanjing* and *S. pallidipatellis*. However, Cornic and Ledoux (2013) reports teeth, but only on the promargin: “Marge antérieure des chélicères garnie de trois dents, marge postérieure mutique”. We compared the dentation of specimens of *S. pallidipatellis* (Figs 48–50) to both literature images and to that of *S. betyar* sp. nov. (Figs 51, 52). The cheliceral dentation of *S. pallidipatellis* (Figs 48–50) looks almost identical to

literature sources (Kamura 1992: fig. 3). However, we also agree with Cornic and Ledoux (2013) and interpret it as teeth rather than a keel or carina. Azevedo et al. (2018) well illustrated the non-serrated cheliceral promargin (Azevedo et al. 2018: fig 20. e, g), which is diagnostic to the subfamily Herpyllinae. However, the keel on the promargin may not just “be a subtle projection or may appear as teeth with fused bases” (Kamura 1992). Despite Kamura’s (1992) description and subsequent authors (Song et al. 2004; Kim and Lee 2013) implies the latter; we observed that the bases of the teeth are in fact separated as viewed from an oblique view (Figs 49, 50). We observed five teeth lumped together with a smaller one further placed, whereas there was one clear tooth on the retromargin. Such dentation has been observed (but not illustrated) in *Latonigena* Simon, 1893 by Ott et al. (2012), thus this character may require a second look with more genera involved. The dentation of *S. betyar* sp. nov. (i.e., two teeth on the promargin and one on the retromargin, Figs 51, 52) is different also from *S. tescorum* (i.e., three teeth on the promargin, none on the retromargin) which seems a good confirmation to separate the two species.

Species of the genus occur in a wide variety of habitats including lowland forests and grasslands, however,

specimens were collected mainly in mountainous regions (Kwon et al. 2014; Hernández-Corral et al. 2017; Naumova et al. 2021). According to our data, *S. betyar* sp. nov. is a typical member of the ground-dwelling spider fauna of lowland forest steppes. The relatively understudied forest steppes of Central Europe are among the most complex ecosystems in the region, and their nature conservation value is high. Forest steppes are important biodiversity hotspots (Gallé et al. 2022b) and listed in the Habitats Directive of the European Union. They harbour numerous endemic and rare plant and animal species, including several recently described spiders such as *Parasyrisca arrabonica* Szinetár & Eichardt, 2009 (Gnaphosidae) and *Alopecosa psammophila* Buchar, 2001 (Lycosidae). Although the abundance of *S. betyar* sp. nov. seems to be very low, this species presumably occurs in vast areas of forest steppes of Central and Eastern European forest steppes.

Acknowledgements

The study would have been impossible to carry out without the valuable help of colleagues who have sent comparative material of *S. pallidipatellis* (Takahide Kamura; Otemon Gakuin University), and *S. tescorum* (Antonio Melic; Sociedad Entomológica Aragonesa). This work was supported by the Hungarian National Research, Development and Innovation Office (Grant Id: NK-FIH-FK-142926; NKFIH-KKP-133839). RG was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences.

References

- Azevedo GHF, Griswold CE, Santos AJ (2018) Systematics and evolution of ground spiders revisited (Araneae, Dionycha, Gnaphosidae). *Cladistics* 34(6): 579–626. <https://doi.org/10.1111/cla.12226>
- Bösenberg W, Strand E (1906) Japanische Spinnen. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 30: 93–422.
- Breitling R (2018) Eric Duffey's spider collection in the Manchester Museum – an update. *Newsletter - British Arachnological Society* 141: 5–9.
- Coddington J (1983) A temporary slide mount allowing precise manipulation of small structures. *Verhandlungen des naturwissenschaftlichen Vereins Hamburg* 26: 291–292.
- Cornic JF, Ledoux JC (2013) De araneis Galliae, III.1: *Sernokorba tescorum* (Simon, 1914). *Revue Arachnologique* 17(6): 83–85.
- Császár P, Torma A, Gallé-Szpijak N, Tölgyesi C, Gallé R (2018) Efficiency of pitfall traps with funnels and/or roofs in capturing ground-dwelling arthropods. *European Journal of Entomology* 115: 15–24. <https://doi.org/10.14411/eje.2018.003>
- Gallé R, Tölgyesi C, Torma A, Bátori Z, Lörinczi G, Szilassi P, Gallé-Szpijak N, Kaur H, Makra T, Módra G, Batáry P (2022a) Matrix quality and habitat type drive the diversity pattern of forest steppe fragments. *Perspectives in Ecology and Conservation* 20(1): 60–68. <https://doi.org/10.1016/j.pecon.2021.11.004>
- Gallé R, Korányi D, Tölgyesi C, Lakatos T, Marcolin F, Török E, Révész K, Szabó ÁR, Torma A, Gallé-Szpijak N, Marja R, Sztár K, Deák B, Batáry P (2022b) Landscape-scale connectivity and fragment size determine species composition of grassland fragments. *Basic and Applied Ecology* 65: 39–49. <https://doi.org/10.1016/j.baae.2022.10.001>
- Hernández-Corral J, Melic A, Micó E (2017) Primera cita del género *Sernokorba* Kamura, 1992 para la Península Ibérica con nuevos datos sobre *Sernokorba tescorum* (Simon, 1914) (Araneae: Gnaphosidae). *Revista Iberica de Aracnologia* 30: 167–169.
- Kamura T (1992) Two new genera of the family Gnaphosidae (Araneae) from Japan. *Acta Arachnologica* 41(2): 119–132. <https://doi.org/10.2476/asjaa.41.119>
- Kim ST, Lee SY (2013) Arthropoda: Arachnida: Araneae: Mimetidae, Uloboridae, Theridiosomatidae, Tetragnathidae, Nephilidae, Pisauridae, Gnaphosidae. *Spiders. Invertebrate Fauna of Korea* 21(23): 11–83.
- Kwon TS, Lee CM, Kim TW, Kim SS, Sung JH (2014) Prediction of abundance of forest spiders according to climate warming in South Korea. *Journal of Asia-Pacific Biodiversity* 7(2): 133–155. <https://doi.org/10.1016/j.japb.2014.04.002>
- Marusik YM (2009) A check-list of spiders (Aranei) from the Lazo Reserve, Maritime Province, Russia. *Arthropoda Selecta* 18: 95–109.
- Murphy J (2007) Gnaphosid genera of the world. *British Arachnological Society St Neots, Cambridgeshire*, 605 pp.
- Namkung J (2002) The spiders of Korea. *Kyo-Hak Publishing Co.*, Seoul, 648 pp.
- Naumova M, Blagoev G, Deltchev C (2021) Fifty spider species new to the Bulgarian fauna, with a review of some dubious species (Arachnida: Araneae). *Zootaxa* 4984(1): 228–257. <https://doi.org/10.11646/zootaxa.4984.1.18>
- Nentwig W, Blick T, Bosmans R, Gloor D, Hänggi A, Kropf C (2022) Spiders of Europe. Version 11.2022. <https://doi.org/10.24436/1>
- Ono H (1988) A revisional study of the spider family Thomisidae (Arachnida, Araneae) of Japan. *National Science Museum, Tokyo*, 252 pp.
- Ott R, Rodrigues ENL, Brescovit AD (2012) Seven new species of *Latonigena* (Araneae, Gnaphosidae) from South America. *Iheringia. Série Zoologia* 102(2): 227–238. <https://doi.org/10.1590/S0073-47212012000200016>
- Simon E (1914) Les arachnides de France. *Synopsis générale et catalogue des espèces françaises de l'ordre des Araneae. Tome VI. 1re partie*. Roret, Paris, 308 pp.
- Song DX, Zhu M, Chen J (1999) The Spiders of China. *Hebei Sci. Technol. Publ. House, Shijiazhuang*, 640 pp.
- Song DX, Zhu M, Zhang F (2004) *Fauna Sinica: Invertebrata Vol. 39: Arachnida: Araneae: Gnaphosidae*. Science Press, Beijing, 362 pp.
- Tölgyesi C, Valkó O, Deák B, Kelemen A, Bragina TM, Gallé R, Erdős L, Bátori Z (2018) Tree-herb co-existence and community assembly in natural forest-steppe transitions. *Plant Ecology & Diversity* 11(4): 465–477. <https://doi.org/10.1080/17550874.2018.1544674>